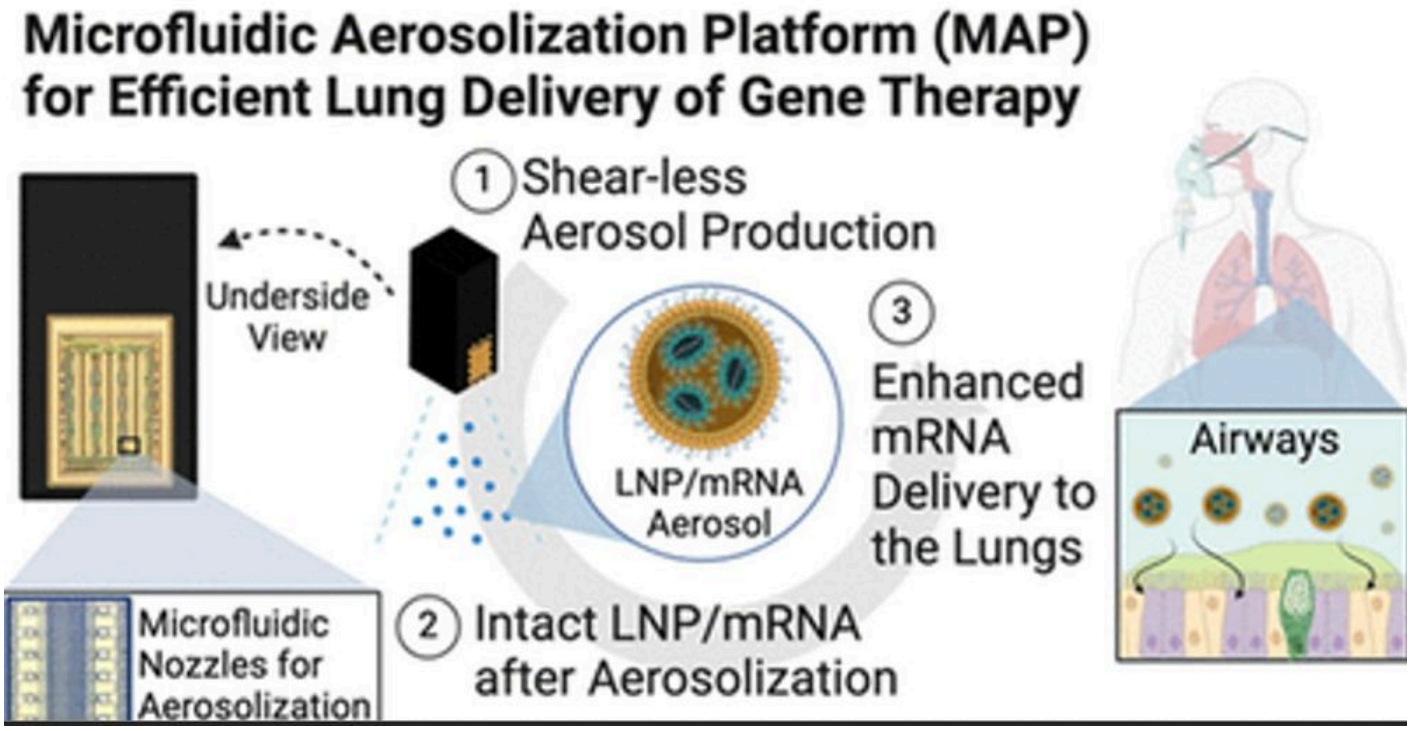
Aerosolization of Lipid Nanoparticles for mRNA Inhalation Gene Therapy | Aerosolized Nanobots

TRUTH11.COM

May 25, 2024 7 min



Aerosolization of Lipid Nanoparticles for mRNA Inhalation Gene Therapy, Aerosolized Nanobots For Biosensing Applications And Concerns About Biological And Chemical Weapons Convention,

ANA MARIA MIHALCEA, MD, PHD | Substack.com

Subscribe

Recently the aerosolization of nanoparticles has been published as a successful route of gene therapy mRNA application.

Microfluidic Platform Enables Shearless Aerosolization of Lipid Nanoparticles for mRNA Inhalation

> Leveraging the extensive surface area of the lungs for gene therapy, the inhalation route offers distinct advantages for delivery. Clinical nebulizers that employ vibrating mesh technology are the standard choice for converting liquid medicines into aerosols. However, they have limitations when it comes to delivering mRNA through inhalation, including severe damage to nanoparticles due to shearing forces. Here, we introduce a microfluidic aerosolization platform (MAP) that preserves the structural and physicochemical integrity of lipid nanoparticles, enabling safe and efficient delivery of mRNA to the respiratory system. Our results demonstrated the superiority of the MAP over the conventional vibrating mesh nebulizer, as it avoided problems such as particle aggregation, loss of mRNA encapsulation, and deformation of the nanoparticle morphology. Notably, aerosolized nanoparticles generated by the microfluidic device led to enhanced transfection efficiency across various cell lines. ***In vivo*** **experiments with mice that inhaled these aerosolized nanoparticles revealed successful lung-specific mRNA transfection without observable signs of toxicity.** This MAP may represent an advancement for the pulmonary gene therapy, enabling precise and effective delivery of aerosolized nanoparticles.

We also know in 2018 MIT news discussed nanorobots that could be dissolved in watery solutions and can also be aerosolized. I have shown in my research that nano and micro robots and the C19 mRNA delivery system clearly are related. In fact, these micro and nanorobots were seen by researchers in the C19 vials and are now seen in C19 unvaccinated blood.

C19 Uninjected Blood - Darkfield Live Blood Analysis Up To 4000x Magnification Shows Nanobots Self Assembly Of Polymer Networks

Here are some micro robots as discussed in the next article as seen in C19 uninjected blood:

Video: *Micro robots maneuvering through C19 uninjected blood - taken at AM Medical LLC clinic in 2024 by me*

MIT News
ON CAMPUS AND AROUND THE WORLD
SUBSCRIBE

Cell-sized robots can sense their environment

Made of electronic circuits coupled to minute particles, the devices could flow through intestines or pipelines to detect problems.

David L. Chandler | MIT News Office
July 23, 2018

Cell-sized robots can sense their environment

> Researchers at MIT have created what may be the smallest robots yet that can sense their environment, store data, and even carry out computational tasks. **These devices, which are about the size of a human egg cell, consist of tiny electronic circuits made of two-dimensional materials, piggybacking on minuscule particles called colloids.**
>
> **Colloids, which insoluble particles or molecules anywhere from a billionth to a millionth of a meter across, are so small they can stay suspended indefinitely in a liquid or even in air. By coupling these tiny objects to complex circuitry, the researchers hope to lay the groundwork for devices that could be dispersed to carry out diagnostic journeys through anything from the human digestive system to oil and gas pipelines, or perhaps to waft through air to measure compounds inside a chemical processor or refinery.**

“We wanted to figure out methods to graft complete, intact electronic circuits onto colloidal particles,” explains Michael Strano, the Carbon C. Dubbs Professor of Chemical Engineering at MIT and senior author of the study, which was published today in the journal *Nature Nanotechnology*. MIT postdoc Volodymyr Koman is the paper’s lead author.

“Colloids can access environments and travel in ways that other materials can’t,” Strano says. Dust particles, for example, can float indefinitely in the air because they are small enough that the random motions imparted by colliding air molecules are stronger than the pull of gravity. Similarly, colloids suspended in liquid will never settle out.

Strano says that while other groups have worked on the creation of similarly tiny robotic devices, their emphasis has been on developing ways to control movement, for example by replicating the tail-like flagellae that some microbial organisms use to propel themselves. But Strano suggests that may not be the most fruitful approach, since flagellae and other cellular movement systems are primarily used for local-scale positioning, rather than for significant movement. For most purposes, making such devices more functional is more important than making them mobile, he says.

Tiny robots made by the MIT team are self-powered, requiring no external power source or even internal batteries. A simple photodiode provides the trickle of electricity that the tiny robots’ circuits require to power their computation and memory circuits. That’s enough to let them sense information about their environment, store those data in their memory, and then later have the data read out after accomplishing their mission.

Such devices could ultimately be a boon for the oil and gas industry, Strano says. Currently, the main way of checking for leaks or other issues in pipelines is to have a crew physically drive along the pipe and inspect it with expensive instruments. In principle, the new devices could be inserted into one end of the pipeline, carried along with the flow, and then removed at the other end, providing a record of the conditions they encountered along the way, including the presence of contaminants that could indicate the location of problem areas. The initial proof-of-concept

> devices didn't have a timing circuit that would indicate the location of particular data readings, but adding that is part of ongoing work.
>
> **Similarly, such particles could potentially be used for diagnostic purposes in the body, for example to pass through the digestive tract searching for signs of inflammation or other disease indicators, the researchers say.**
>
> **Most conventional microchips, such as silicon-based or CMOS, have a flat, rigid substrate and would not perform properly when attached to colloids that can experience complex mechanical stresses while travelling through the environment. In addition, all such chips are "very energy-thirsty," Strano says. That's why Koman decided to try out two-dimensional electronic materials, including graphene and transition-metal dichalcogenides, which he found could be attached to colloid surfaces, remaining operational even after after being launched into air or water. And such thin-film electronics require only tiny amounts of energy. "They can be powered by nanowatts with subvolt voltages," Koman says.**

Here is some of the robots in C19 unvaccinated blood, they have excellent maneuvering capabilities:

Video: Micro robots maneuvering through C19 uninjected blood and self assembling polymers - taken at AM Medical LLC clinic in 2023 by me

This is a very interesting consideration given what we see now - how the aerosolization of nanobots could be abused as biological weapons - I believe this is the scenario we are seeing now.

Aerosolized Nanobots: Parsing Fact from Fiction for Health Security—A Dialectical View

> It was recently reported that nanobot sensors could be aerosolized and deployed for the detection of various airborne chemicals.[1] **Such capabilities are of evident utility in and benefit to medicine, as well as to detect toxins in the environment**

(functioning as a nanoscalar “canary” to warn of hazardous contamination in industrial sites) and/or as a threat awareness system that could be employed in both public and military settings.[2]

Nanoscalar robotics can be used as both sensors and receiver-delivery devices, and the controllability of these technologies enable their directed activity in biological organisms. Such devices—either operating in tandem as distinct sense-and-engage systems, or as single devices with both sense and delivery modes—could be employed to assess, respond to, or modify molecular and chemical characteristics of a biological target. As recent studies have indicated, these approaches can be used in clinical care to more precisely monitor tissue, organ, and overall bodily states and to alter the structure and function of biological tissues and systems at a variety of scales, from the subcellular to the systemic and organismic. To be sure, there is significant value in this technology's current and near-term capabilities in affording more granular methods and tools of evaluating and treating disease and injury.[1-3]

However, we posit that the development of aerosolizable nanomaterials and devices also poses defined risks to public health and biosecurity that warrant consideration, address, and constraint. **Aerosolized nanobots could be used to sidestep extant proscriptions of the current Biological and Toxin Weapons Convention (BWC) or Chemical Weapons Convention** (CWC).[4,5] The properties of these devices that allow their stable aerosolization also confer ability to remain suspended for longer periods of time in a variety of environments. **They can be partially or fully autonomous and are capable of storing information with potential to identify or affect specific biological targets.** They possess the ability to move independently and up to 2 feet multidirectionally in a closed space, and they can be disseminated much further when dispersed via a spray mechanism or other propellant. **Their size (and “programmability”) allows them to easily enter unprotected bodily spaces and to penetrate protective gear. A key limiting factor is the energetics required for nanobots' operations.** If the nanobot was to rely on stored energy (eg, that when assembled or released), then energy demand would constrain functional durability, as current nanobotic systems do not have extensive energy-storing capacity.

> **However, a nanobotic system capable of collecting energy from either its environment (eg, via thermal transfer or conversion), or through interaction with non-robotic nanomaterials, could effectively decrease such constraints. As well, the convergence of nanotechnology with synthetic biology (eg, CRISPR-Cas9 gene editing,[6,7] use of information about synthesizing viruses[8,9]) could lead to a more effective capability to deliver new, and increasingly potent, morbid or lethal synthetic microbes or chem-bio hybrids. These could be customized to create novel agents that could be weaponized and, given their novelty, are not surveilled or recognized by existing regulatory bodies or anticipated by public health and biosecurity operations.**
>
> To be sure, many of the capabilities incurred by weaponized nanobots (eg, motion, information collection and storage, programmability, aerosolized dissemination, ability to enter unprotected bodily cavities, and ability to penetrate protective gear) are already possible with currently existing biological agents. However, certain aspects of nanotechnology confer additional capabilities. **A prime example is that nanotechnologies involve chemistries (eg, silicon, elemental metals, long-chain, and branched polymers) and mechanisms (eg, electromechanical and optical information and energy handling) that are radically different from biologicals.** Biological systems are not evolved to recognize and interfere with (many) nanotechnological functions and capabilities. **Thus, nanodevices could pose an emerging threat as either stand-alone weapons or as force multipliers for extant biochemical agents.** This potential to create such new weaponry is not likely to escape the notice of adversaries intent on subtly influencing specific events or, more broadly, providing overmatch capabilities to gain advantage during major conflict or gray zone actions. A nation-state or independent nonstate laboratory with capabilities similar to those employed to aerosolize nanomaterials could reproduce the results of this research with relative ease.

Summary:

mRNA lipid nanoparticle technology for gene therapy has been successfully implemented in living systems. We also know that nanorobots have been deployed for

watery solutions and aerosolized. Both applications bring up the weaponization of these technologies, which are discussed in the last article. From my research, I can see that it already has been weaponized, as these nano and micro robots are in everyone's blood. I want to bring to the forefront, that aerosolized gene modification and nanorobotics have already been considered for weaponization. My strategy is still disabling the building blocks of the technology.

Original Article: https://anamihalceamdphd.substack.com/p/aerosolization-of-lipid-nanoparticles

Subscribe to Truth11.com

Receive Articles By Email • Support Independent Media

Subscribe now

Support Truth11.com • Make A Donation

• Or Become A Monthly Subscriber